

Remarks

Claims 1-50 are now pending in this application. The Office Action rejected claims 1-31 and 33-40 under 35 U.S.C. §103(a) as being unpatentable over Holmes et al., U.S. Patent No. 6,490,769 (Holmes). The Office Action further rejected claims 41-44 and 46-50 under 35 U.S.C. §103 as being unpatentable over Shiba, U.S. Patent No. 6,880,063 (Shiba). Claims 19-25 were rejected by the Office Action under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. Additionally, the Office Action objected to the drawings under 37 C.F.R. 1.83(a).

Although the Office Action objected to claims 32 and 45 by virtue of their dependency on rejected base claims as outline above, Applicants appreciate the Examiner's acknowledging the allowable subject matter in each of these objected-to claims.

Applicants respectfully traverse all of the rejections and objections, as the cited references do not disclose or suggest the invention as recited in any of claims 1-50. Nonetheless, Applicants have made amendments to the drawings, specification and claims in deference to the Examiner and to resolve any perceived lack of clarity. Applicants respectfully submit that no new subject matter is being added by the above amendments, as the amendments are fully supported in the specification, drawings and claims as originally filed.

The claims of the present invention generally regard a method and apparatus for audio/video synchronization that, according to one embodiment, store and later encode an audio frame in response to receiving a video synchronization signal. Since the

corresponding video frame is already slaved to the video synchronization signal, audio samples are effectively processed in sequence with video data. Put another way, the encoding sequence of the audio frame coincides with that of the video synchronization signal. The claimed features of Applicants also include counting a number of samples of an audio frame representing a time duration equal to a difference between a second video synchronization signal and a last encoded sample of the audio frame. Those audio samples may ultimately be discarded from the bit stream to effectively achieve synchronization at the ending of an encoding process.

None of the cited prior art motivates, teaches or suggests either above-stated features, at least one of which is recited in each independent claim of Applicants. The absence of such a suggestion or motivation within the prior art speaks to the disparate processes of each cited reference. For instance, Holmes seeks to synchronize data by mathematically manipulating the audio sampling rate. As admitted in the Office Action, such rate adjustments do not contemplate encoding an audio frame in response to a video synchronization signal. The sampling rate adjustments of Holmes do, however, involve extensive programming and processing delays that are obviated by the claimed invention of Applicants. As also acknowledged by the Examiner, the Shiba reference does not suggest or motivate counting a number of samples of an audio frame representing a difference between a second video synchronization signal and a last encoded sample of an audio frame. There is no reason to count audio frames in Shiba because the processes of that prior art reference instead focus on skipping or repeating frames of data to control a buffer output rate. In

contrast to the invention of Applicants, such repeating and skipping of frames may materially and detrimentally alter original source data.

In contrast, claim 1 recites a process for synchronizing audio and video signals that includes encoding an audio frame after receiving a first video synchronization signal. To this end, the audio frame is stored in a DSP, and encoding parameters are set prior to receiving a start command from a host. The start command instructs the DSP to begin encoding the audio frame in response to a video synchronization signal. Consequently, the frame is encoded after receiving the first video synchronization signal at the DSP. As such, the encoding sequence of the audio frame coincides with the video synchronization signal. Since the corresponding video frame is already slaved to the video synchronization signal, the audio samples are effectively processed in sequence with the video data.

not in claims

Holmes fails to suggest or motivate the features of claim 1. For instance, the Office Action acknowledges on page 11 that Holmes fails to disclose temporarily storing an audio frame, and then encoding the audio frame in response to a first video synchronization signal. The failure of Holmes to suggest this feature of claim 1 is attributable to the very different manner in which Holmes attempts to synchronize data. More specifically, the apparatus of Holmes adjusts the rate at which audio data is sampled to synchronize the audio data with video data. As shown in Fig. 5 and discussed at column 2, lines 34-44, a frequency synthesizer 300 includes a phase lock loop 144 that generates an oversampled clock signal whose frequency is at least twice as great as the frequency of a video sampling clock. Holmes relies on a frequency divider that divides the oversampled clock signal to

generate its audio sampling clock. In so doing, the frequency synthesizer 300 generates the audio sampling clock as a ratio of a video rate clock.

*See P. 33-4
Holmes video clock -*

In contrast to the relatively simple and elegant processes of the present invention that synchronizes both the audio and video signals according to a synchronization signal from a video clock, Holmes requires rate adjustment, calculations and other processing of a video clock signal and other parameters to adjust an audio sampling rate. As discussed in the background of Applicants' disclosure, such sampling rate adjustments of Holmes implicate extensive programming and processing delays. Further, adjustments of the transfer bit rate are restricted by characteristics of the peripheral hardware. As such, sampling error may aggregate to hinder the effectiveness of synchronization processes.

*Yes
Video sync
142*

Applicants traverse any assertion in the Office Action that it would have been obvious to encode an audio frame in response to receiving a first video synchronization signal, which represents an important improvement over the prior art synchronization systems. Given the absence of a suggestion or motivation in Holmes, any such assertion could only be considered impermissible hindsight. Consequently, Applicants respectfully submit that the 35 U.S.C. §103(a) rejection of independent claim 1 should be withdrawn. Each of claims 2-18 that depend from claim 1 includes at least one additional feature, and thereby further distinguishes over Holmes. As such, reconsideration and allowance of claims 1-18 are respectfully requested.

Independent claim 19 recites a method of synchronizing audio and video data that includes receiving a stop command from a host. The stop command initiates a count of a number of audio samples of an audio frame that occurs subsequent to the occurrence of a

second video synchronization signal. The second video synchronization signal is received and a number of samples of the audio frame representing a time duration equal to the difference between the second video synchronization signal and the last encoded sample of the audio frame is accomplished.

As discussed above, Holmes adjusts the sampling rate of audio in attempting to synchronize it with video. Nowhere in the disclosure of Holmes is, for instance, Applicants' feature of counting samples to determine a difference between a video synchronization signal and a last encoded sample suggested or taught. This is because the Holmes apparatus has no need for such counted data, as it is instead concerned with adjusting the sampling rate to compensate for timing discrepancies. For at least this reason, Applicants respectfully submit that the 35 U.S.C. §103(a) rejection of independent claim 19 should be withdrawn, as should the rejections of those depending upon independent claim 19. In fact, dependent claims 20-27 include additional features that further distinguish the invention of Applicants from the cited prior art. As such, reconsideration and allowance of claims 19-27 are respectfully requested.

Independent claim 28 recites a data transmission apparatus that, in part, temporarily stores an audio frame and encodes it in response to a first video synchronization signal. As discussed in connection with the rejection of claim 1, the Office Action admits that the Holmes reference fails to temporarily store an audio frame and encode the audio frame in response to a synchronization signal. Moreover, there is no suggestion or motivation anywhere in Holmes to encode an audio frame in response to such a synchronization signal. The processes of Holmes instead teach, suggest and motivate manipulating the output of a

video clock, along with other parameters, to adjust an audio sampling rate. Such adjustment of a sampling rate presents problems associated with the prior art that are overcome by the more elegant encoding processes of Applicants. Consequently, claim 28 is novel and non-obvious for substantially the same reasons as stated above, and its reconsideration and allowance, along with claims 29-40 that depend therefrom, are respectfully requested.

Among other features, claim 41 generally recites an apparatus that includes a DSP for counting the number of samples of an audio frame representing a time duration equal to a difference between a second video synchronization signal and a last encoded sample of the audio frame in response to receiving a stop command. As admitted on page 17 of the Office Action, Shiba fails to disclose a DSP operable to count a comparable number of samples. To remedy this deficiency, the Office Action asserts that it would have been obvious to "replace the decode processes 20 by a DSP processor so that the synchronization of the decoded audio would not be delayed in regards to the video's final output stage."

Applicants traverse any assertion that it would have been obvious to modify Shiba in such a way that would include counting the number of samples of an audio frame representing the time duration equal to the difference between a second video synchronization signal and a last encoded sample of the audio frame. Shiba only teaches and suggests repeating or skipping data frames to achieve synchronization (column 4, lines 65-67 to column 5, line 1). In so doing, there is no reason to consider counting frames, let alone a number of samples of an audio frame representing a time duration equal to the

difference between a second video synchronization signal and a last encoded sample of the audio frame. As such, any such assertion can only be impermissible hindsight.

Consequently, claim 41 is not suggested or motivated by Shiba, and its reconsideration and allowance, along with claims 42-50 that depend therefrom, are respectfully requested.

Applicants therefore submit that all pending claims are patentable over the prior art of record, and reconsideration and allowance of all pending claims are accordingly requested. Moreover, Applicants reserve the right to specifically traverse any assertion made in the Office Action with regard to a dependent claim rendered moot by the above discussed patentability of its respective independent claim. If the Examiner has any questions regarding the foregoing, or which might otherwise further this case onto allowance, the Examiner may contact the undersigned at (513) 241-2324. Moreover, if there are any charges or credits that are necessary to complete this communication, please apply them to deposit account 23-3000.

Respectfully submitted,

WOOD, HERRON & EVANS, LLP

By:


Douglas A. Scholer

WOOD, HERRON & EVANS, LLP
2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202-2917
513-241-2324 (phone)
513-241-6234 (fax)